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except in so far as precautions concerning observation, memory, and the effects of predisposition and prejudice may be stated. It is equally probable that significant generalizations of scientific practise may fail because of too close association between the materials and the ways of handling them, except in so far as certain systems of classification and arrangement of materials are evident. And there remains the rhetorical problem of the exposition of the results of thinking which can still be served by the survivals of Aristotelian formulæ, although the formal fallacies must be conceived rather as mistakes in reference to materials cited than as errors in deduction. Thus undistributed terms usually indicate a genuine opinion that the whole of a class is involved in a relation, an error in fact and not in inference.

No final definition of logic can then be laid down. In the last analysis logic appears as a method for the attainment of ideas approved for some reason as true. But the grounds for approval can change and with them the conception of the means of attaining the end. Primitive, Greek, and Scholastic aims still obtain amongst us and the most that can be said is that our age most generally prizes the instrumental conception of ideas. Consequently the instrumentalist conception of logic is most pertinent to it. This logic is most at home in the region of applied science. It is naturally disquieting to the ultra-conservative, distasteful to the ethic temperament, and resisted by orthodox theologians, although in each case it may be bent toward the end. Mankind is now seeking consciously directed development, but if it ever again seeks stability, who can say what logic will then prevail? Logic, like all other philosophic desciplines, has its inception in social conditions and its justification in the fulfilment of needs. Its systems, like other systems within philosophy, are not discarded because they have been found to be false, but because they have become uninteresting when new social conditions have brought to the front needs they are unfitted to meet. Errors can undergo correction, but there is no antidote to loss of interest, although the inertia of habit may temporarily maintain both philosophies and social institutions beyond their day.

HAROLD CHAPMAN BROWN.

STANFORD UNIVERSITY.

PURPOSE

WHEN two dice are thrown on a table, we say that there are eleven chances out of thirty-six that at least one four will be thrown. There is a branch of mathematics given over to the calculation of this sort of chance or probability. But chance in another sense means "the combination of several systems of causes which are developed each in its own series independently of the others."[1] "For instance, if in the game of rouge-et-noir, I bet that the black will win, and it wins accordingly, it is clear that my desire and my word could not have had any influence on the winning of one color or the other, and likewise that the arrangement of the cards, which I did not know, could not have had any influence on the choice I have made. In this case, two series of facts, absolutely independent of each other, have happened to coincide with each other, and to harmonize, without any mutual influence. This kind of coincidence is what is called *chance*."[2] Harmony does at times, we recognize, come about in this fashion by chance. But when we find a great number of similar cases in which two phenomena are in harmony with one another, we refuse to believe that the series of events leading to the one phenomenon is independent of the series of events leading to the other. On the contrary, we believe that if we follow back the series of events leading to the one phenomenon we shall come to a point where there is some communication with the series of events leading to the other. Now we do find repeated and persistent cases of harmony between the organism and its environment. In such a case it can not be that the organism and its environment have developed in independence of one another. Rather, in the previous history of both organism and environment, there must be some point at which the environment has influenced the development of the organism, or at which the organism has influenced the environment, or at which each has influenced the other. Communication between the two causal series there must have been. The question is: where and in what form has the communication taken place?

Since Darwin's time men in answering this question have often had recourse to the theory of natural selection. The environment, it is said, has influenced the development of the organism by causing those individuals to survive who are most in harmony with it.[3] But there are some phenomena of which this theory, thus stated, is not a sufficient explanation. The admirable fitness of the human eye has been pointed out by Bergson, Von Hartmann, and others. This complex organ, valuable in the struggle for existence only when completely formed, can not have originated by the natural selection of one part after another. For the organism equipped with but one of the elements that make up the eye would have had no advantage over his fellows and would, on this theory, have had no reason to survive them. On the other hand, it seems quite impossible that the complex eye, completely formed, could have occurred as a chance variation. It is so well adapted to its environment that we can not believe that its development has neither influenced nor been influenced by that environment. Either some theory other than that of natural selection must be called in to explain such an organ, or the eye has not developed in either of the ways that have been considered.

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[1] Cournot, quoted in Janet, *Final Causes*, translation of the second edition by Affleck, p. 19, note.

[2] Janet, *Final Causes*, translation by Affleck, p. 18.

[3] Warren, *A Study of Purpose*, this JOURNAL, Vol. 13, p. 40.

Similarly no completely satisfactory explanation has been given of the way in which purposive actions achieve their objects. I desire to eat an apple and then appropriately stretch out my hand and bring it to my mouth. Professor Warren in a recent number of this JOURNAL argues that such an effect does not follow until the proper association has been set up.[4] But, we may ask, how does it happen that the proper association is ever set up? Surely I do not first make the appropriate reaction entirely by chance. It is not credible that I should come to stretch my hand and that the apple should come to be where it is without there having been some causal connection between me and the apple. Perhaps I succeed by the method of trial and error. But though in the course of my experimenting I make many useless reactions and happen upon the proper one, my reactions, even the useless ones, are not made independently of the apple. There is a causal relation between me and the apple that results in my making reactions of a certain type. Indeed the structure of some organisms is such that this causal relation leads them to make reactions that fall within a very, very narrow range and to make such reactions persistently until the proper one is hit upon. It is just by chance that the organism at a given trial makes the proper reaction instead of one slightly different. For the previous causal relation between it and its object is the same whether it make the proper reaction or a slightly different one. Nevertheless it is not by chance that this organism is reacting towards its object and is not falling asleep. There is a causal relation between it and its object that accounts for the type of reaction it is making, if it does not fully account for the one successful reaction that it finally makes. So too when I cry "four" and the die that has been thrown falls with a four uppermost, it is by chance that I have cried "four" instead of "six." There is no previous causal relation between me and the die that explains why I have called just the number that has turned up. But there is a previous causal relation between me and the die that has resulted in my calling one of the numbers from one to six instead of calling "chair." When an organism experiments by the method of trial and error, consequently, there must have been a previous causal relation between it and its object to account for the type of reaction it is making. Neither the concept of "chance" nor that of "trial and error" is a satisfactory explanation of the harmony between the object and the type of response the organism makes.

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[4] *Ibid.*, pp. 17, 18.

So far, then, there has in certain cases been a failure to segregate and describe that causal relation between organism and environment that has led on the one hand to an organism fitted for its environment and on the other hand to an environment fitted for the organism. In view of this failure, the concept of teleology has been brought forward as a satisfactory explanation. But what is the explanation offered by teleology? According to the doctrine of final causes there is a prevision of the harmonious situation to be arrived at that leads to the organism becoming the thing that it is, namely, a thing adapted to its environment. If we follow back the train of events leading to the organism as we know it, we shall come, it is said, to a point at which there is a desire to bring about the harmonious situation that finally results. Let us however not lose sight of our problem. The harmony between the organism and the environment forces us to believe that there is some communication between the series of events leading to the organism and the series of events leading to the environment. A conscious or unconscious purpose placed in or behind the series of events leading to the organism is not in itself such a connecting link. We require further to be shown how this purpose affects or is affected by the series of events leading to the environment. In short, the problem of describing the method in which the two series are linked together is still on our hands. It really makes no difference whether or not the series of events leading to the organism is causally determined. An indeterminism in the one series does not destroy our belief that there must be a connection between the two series to account for the harmony that results. For this harmony we seek a cause; and this cause can not lie in the one series, but must be a link between the two.

Consequently the theory that there is purpose at some point in the series of events leading to the organism offers us no help in our search for a connecting link. It neither challenges our belief that there must be such a link nor suggests to us what this link may be. The relevant argument for teleology, in fact, concerns only the one series, namely, the series of phenomena leading to the organism adapted to its environment. It leaves to one side the question as to what may be the connecting link that is an efficient cause of the harmony between the organism and the environment. For on the one hand, whether purpose exists or not, there must be a connection between the series of organic phenomena and the series of events in the environment. And on the other hand, until the nature of this link is known, no argument can be drawn from the fact that it exists to prove either that there is or is not such a thing as purpose in the series of organic changes. Nor when we restrict ourselves to the one series of events, namely, that resulting in the adapted organism, do we find any necessary connection between questions of causality and the question whether purpose exists. We are here dealing only with the history of the organism. The question that arises with respect to causality is not the question how the organism comes to be adapted to its environment, for the cause of such an adaptation must be sought in a connecting link between the two. The question that arises here is whether one state in the life of an organism is determined by what has preceded and how. Now there is no necessary connection, I say, between this question and the question whether purpose exists. For though organic phenomena should be unpredictable, it does not follow that there is a purpose guiding the organism in its career. If organic phenomena are not subject to laws of causality, then we ought not seek an efficient cause of that which we find. Purpose, though it exists, can not have been an efficient cause, and so can not satisfy us in our vain search for such a cause. If, on the other hand, organic phenomena do point back to previous events in the history of the organism, with which events they are causally connected, then these previous events furnish the cause that we seek whether there be a purpose associated with them or not. The concept of purpose, in short, neither aids us in our search for a causal explanation of the harmony between organism and environment, nor hinders us in our search for causal relations between successive phenomena in the life of the organism. Purpose, then, is independent of cause, independent of it in the sense that arguments for teleology can be based upon conflicting theses as to the causal relations that obtain.

It is, in truth, upon analogy or upon a definition of purpose that the argument for design must be based. "It must be confessed," says Janet, "that if experience had not given us beforehand somewhere the type of the final cause, to all appearance we never could have invented this notion."[5] We first attend to one series of phenomena, namely, the series that issues in my own actions. We find at a previous point in this series, or associated with it, a consciousness of the aim to be attained. We then attend to other series of phenomena, to the growth and reactions of organisms in general. And we conclude that since these series are so similar to the series we first investigated, there must likewise be a purpose in or associated with them. The argument for design, it is evident, can not get started unless there is admitted to be purpose in the series of events leading to my own actions. If it is denied that there is consciousness in

[5] Janet, *Final Causes*, tr. by Affleck, p. 92.

or associated with this first series, then it can not be proved there is consciousness in or associated with any other series, no matter how similar. If, however, so much is admitted in the series of events leading to my own actions as a purpose objectively defined, then perhaps the thesis can be rendered plausible that there is the same sort of purpose in other series of organic phenomena. The same result can, of course, be obtained without recourse to analogy. For if purpose be defined in terms of the characteristics my actions and other organic phenomena have in common, the purposiveness of these phenomena follows directly from the definition. Now what is the similarity between me and other organic phenomena that might lead me to assume a consciousness in them if there is admitted to be a consciousness in me, or a purpose objectively defined in them if there is admitted to be such a purpose in me? The series of events leading to my actions and the series of events leading to other organic phenomena evince in common, it has been said, an adaptation to the future.[6] The environment follows its line of development and the series of organic phenomena develops on its part to a point at which the organism is in harmony with the environment. But the organism is adapted to the object in its environment before that object is there. In other words, the series of organic changes reaches its conclusion before the organism is in contact with its object, that is to say, before the environment has reached a corresponding point in its development. Now this characteristic that my actions and other organic phenomena have in common may be a good basis for analogical reasoning. But this fact that one series reaches its conclusion before the other can not relieve us from the necessity of finding a connecting link between the two series to account for the final harmony between organism and environment. Besides evincing an adaptation to the future, organic phenomena have been said to have other characteristics in common. Organic phenomena, it has been said, are not subject to certain physical laws, such as the second law of thermodynamics. And it has been said, notably by Driesch, that organic phenomena are not causally determined, one by the other. Now these facts, and other facts that have been adduced, are all proper bases, if true, for an argument from analogy. But, let me repeat, the thesis that organic phenomena are not causally determined can not lead us directly to the belief that there is a purpose in this series of phenomena. It implies that there is no determining factor to account for organic development and can not lead us to seek such a determining factor in a purposive entity.

The characteristics my actions and other organic phenomena have in common are no doubt sufficiently distinct to make possible a definition of purpose in terms of them. They are also sufficiently widespread and numerous to lend much force to an argument from analogy. Nevertheless they do not force upon us an absolute conviction that whatever we find in the case of my own actions exists in the case of other organic phenomena. They force upon us only a certain presumption that things alike in so many respects are probably also alike in others. Furthermore, the qualities that are carried over by analogy and presumed to exist in other organic phenomena can only be qualities that are admitted to exist in the case of my own actions. Within these limits the general form of the argument for teleology is simple and unassailable. However, to arrive at the conclusion that the purpose that is in or associated with the series of events leading to adaptive organic activity is of one sort rather than another, further argumentation is necessary. If this purpose is held to be an unconscious purpose, it must be shown that an unconscious purpose is not a contradiction in terms. If this purpose is held to be associated, not with the organic phenomena that immediately precede the adaptive response, but with a First Cause that initiates the whole series of organic phenomena, then it must be shown that this First Cause exists. If, finally, it is held that this purpose is not a quality of the organic phenomena we investigate, but is a non-temporal entity associated with these phenomena, then it must be shown that it is not impossible for a non-temporal entity to be related to a temporal one. These, however, are special questions that are not relevant to the general argument for a teleology of some sort. The simple thesis that there is a purpose in organic and perhaps in inorganic phenomena relies merely upon a description of the qualities the entities held to be purposive have in common and upon the assertion that purpose is a thing that is given in these qualities or that is to be inferred from them. It is a thesis that neither necessarily denies the existence of efficient causes nor offers a substitute for them.

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[6] Janet, *Final Causes*, translation by Affleck, p. xviii; Warren, *A Study of Purpose*, this JOURNAL, Vol. 13, p. 33.

When scientific men realize how limited in scope the argument for teleology is, they feel in many cases that the concept of purpose is harmless. They "accept purposive events as a specific class of natural processes"[7] and make no further ado about them. Their attitude is that of a host who greets his guest, but then ignores him. Are final causes, however, to be ignored after they have been admitted? It was Leibniz, scientist as well as philosopher, who was particularly concerned that they should not be. "Final causes," he says, "are of service in physics, not only to make us admire the wisdom of God, which is the principal reason, but also for knowing things and for managing them.''[8] Now there are several ways in which final causes may assist us in knowing things. If we assume that there is in a series of phenomenal events a purpose, nay a supremely intelligent purpose, we may then arrive at an hypothesis as to the manner in which this series of events is developing. It was in this manner that Leibniz arrived at an hypothesis as to the manner in which rays of light are conducted from one point to another. Such hypotheses must of course be tested by experiment before they are acknowledged to be satisfactory, yet the initiation of hypothesis is no mean element in the growth of knowledge. Indeed many of the scientific theories we now accept were, we must recognize, first suggested by teleogical considerations. Again we may be said to be making use of final causes when we conclude from the occurrence of what are held to be purposive events that there is an environment to which these events are adapted. We may find the fossil remains of a dinosaur and conclude therefrom that there was an environment to which such a purposive organism was adapted. We may assume in the human body a desire to combat destructive bacteria and look in consequence for the manner in which such a purpose might be achieved. Such arguments that may be based upon the assumption that purpose exists are not at all unusual. And so we find that though the scientist may be rather shy of the concept of teleology, arguments that may be called teleological are neither useless nor unfamiliar in his domain. Final causes, if they exist, are no substitutes for efficient causes. Yet if they exist, the concept of purpose has a place in science as well as in philosophy.

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[7] Warren, *A Study of Purpose*. This JOURNAL, Vol. 13, p. 6.

ALVIN THALHEIMER.

NEW YORK CITY.

METHODOLOGICAL TELEOLOGY

IT may still be disputed whether the philosophic discovery of the Pragmatic Method has provided the world with a perennial source of new truths, but it is surely beyond dispute that it has stimulated its critics to an unceasing flow of new errors. The last of these which have seemed to me worthy of correction are contained in Professor Warbeke's article on ''A Medieval Aspect of Pragmatism.''[1]

After echoing a number of old misconceptions about Pragmatism as *χαμαιλέοντα καὶ σαθρῶς ἱδρυμένον* Professor Warbeke proceeds to show that he has not yet succeeded in grasping that Pragmatism is primarily a method, not a dogma; a theory of knowledge, not a

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[8] Leibniz, Reply to Reflections found in the *Journal des Savants.* Duncan, *The Phil. Works of Leibniz,* 2d edition. p. 116.

[1] This JOURNAL, XVI., p. 207.